

REMARKS

Claims 1, 2, 5, 6 and 8-13 are pending in the present application. Claims 1, 2, 5 and 6 are herein amended. No new matter has been presented.

Claim Rejections – 35 U.S.C. § 103

The claims recite “forming a diameter of 30 to 300 nm on the surface of said shaped aluminum alloy material by hydrazine monohydrate aqueous solution” and “the fine recesses with a diameter of 30 to 300 nm on the surface are filled with the thermoplastic resin composition by injection.”

Generally, an injection forming is performed in a time less than about 10 sec in an injection mold. Therefore, it is very difficult to fill fine recesses with a diameter of 30 to 300 nm with a thermoplastic resin composition by injection.

The attached photographs demonstrate this. The photographs were photographed with an AFM (Atomic Force Microscope). Only the aluminum of the aluminum alloy-and-resin composite in which aluminum and PPS are unified was dissolved, and the surface of the provided PPS was observed.

Photograph 2 is a surface photograph of PPS which compares the differences when it was molded at 1 MPa and when it was molded at 68 MPa (which is the generally used pressure of PPS).

From the photograph it is understood that PPS resin fills up the fine recesses of the aluminum by injection molding. Thus, it is demonstrated that a crystalline polymer PPS can fill up the fine recesses which was not known to one of ordinary skill in the art at the time of the present invention.

A. Rejection based on Kallenbach in view of Akihoshi

Claims 1, 2, 8, 9 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Kallenbach** (US 5,212,214) in view of **Akihoshi** (US 4,642,161). Favorable reconsideration is requested.

Kallenbach disclose arylene sulfide polymer resin coating compositions. The substrate may comprise aluminum or aluminum alloys, etc. The composition can be deposited on the substrate surface using conventional methods known in the art. Examples of such methods include electrostatic spraying, powder spraying, fluidized bed coating, slurry spraying, etc. (See col. 9, lines 5-13.)

Applicants respectfully submit that Kallenbach in view of Akihoshi does not teach or suggest:

a shaped aluminum alloy material that has been subjected to a dipping process in which it is dipped in a 3 to 10% hydrazine monohydrate aqueous solution at 40 to 70°C, said shaped aluminum alloy material having fine recesses with a diameter of 30 to 300 nm on the surface of said shaped aluminum alloy material; and

a thermoplastic resin composition integrally bonded by filling said fine recesses of said shaped aluminum alloy material by injection, said thermoplastic resin composition containing polyphenylene sulfide as a component

as recited in amended claim 1 and similarly recited in claim 2.

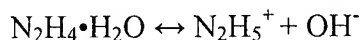
Kallenbach discloses that “the polymer components of the inventive composition are typically cured at a temperature in the range of from about 315°C to about 470°C.” (See col. 9, lines 29-32.)

The injection temperature (cylinder temperature) is about 280-320°C in the present invention. This temperature is very low compared to Kallenbach. Kallenbach is formed at about 315°C to about 470°C. This means that the principle for which the aluminum and the PPS adhere is different in Kallenbach from that in the present invention.

The Office Action acknowledges that Kallenbach does not disclose the recited dipping process. (Office Action, page 2.) The Office Action cites Akihoshi for teaching this process.

Akahoshi discloses a method of bonding copper and a resin together with consistently high bonding strength and acid resistance. Akahoshi discloses removing the oxide layer formed on the surface of copper by using a reducing agent, by a general formula: $\text{BH}_3 \cdot \text{NHRR}'$, and including dimethylamine borane and ammonia borane. (Col. 4, lines 12-20.)

However, the reducing agent in Akahoshi does not correspond with a 3 to 10 % hydrazine (N_2H_4) monohydrate aqueous solution ($\text{N}_2\text{H}_4\text{H}_2\text{O}$) as recited in the present claims. The chemical reaction formula in the present invention is as follows.



By this chemical reaction, the aluminum alloy melts and forms the fine recesses mentioned above. This chemical reaction is not a reduction reaction, but is a basic reaction. Generally speaking, there is a substantial difference between a reduction reaction and a basic reaction. Therefore, the surface of the aluminum alloy is different from a copper alloy in the surface state by the same processing. The surface treatment of copper and the surface treatment of aluminum are not the same and do not have the same properties. Akahoshi does not teach processing an aluminum alloy. And Even if it would have been obvious to modify Kallenbach to

include the processing disclosed in Akahoshi, the modification would not result in the formation of fine recesses as recited in the claims.

Therefore, it is not possible to apply the teachings of Akahoshi with Kallenbach, or alternatively, even if Akahoshi is combined with Kallenbach, the combination does not teach or suggest all of the limitations as recited in the claims.

B. Rejection based on Haack in view of Akihoshi

Claims 1, 2, 5, 6 and 8-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over **Haack** (US 20010036559) in view of **Akihoshi** (US 4,642,161). Favorable reconsideration is requested.

Applicants respectfully submit that Haack in view of Scott does not teach or suggest:

a shaped aluminum alloy material that has been subjected to a dipping process in which it is dipped in a 3 to 10% hydrazine monohydrate aqueous solution at 40 to 70°C, said shaped aluminum alloy material having fine recesses with a diameter of 30 to 300 nm on the surface of said shaped aluminum alloy material; and

a thermoplastic resin composition integrally bonded by filling said fine recesses of said shaped aluminum alloy material by injection, said thermoplastic resin composition containing polyphenylene sulfide as a component

as recited in amended claim 1 and similarly recited in amended claim 2, and the similar method step as recited in amended claims 5 and 6.

Haack discloses a component made from long-fiber-reinforced thermoplastics and characterized by bonding between metal structure and plastic structures. As acknowledged by the Office Action, Haack does not disclose the treatment of a shaped aluminum alloy material as

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recited in the claims. (Office Action, page 3.) The Office Action cites Akihoshi for teaching that the treatment would have been obvious.

For the reasons stated above, Applicants respectfully submit that Akihoshi does not teach the treatment as recited in the claims. Neither Haack nor Akihoshi discloses the treatment process and the resulting structure of the shaped aluminum alloy material as recited in the present claims, and thus, the present claims are non-obvious over Haack in view of Akihoshi.

For at least the foregoing reasons, claims 1, 2, 5, 6 and 8-13 are patentable over the cited references. Accordingly, withdrawal of the rejection of claims 1, 2, 5, 6 and 8-13 is hereby solicited.

In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

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If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,
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Attachments: Photographs 1 and 2
Photographs 1 and 2 with English Translation